What is claimed is:

1. A method of forming a tubular liner within a preexisting structure, comprising:
positioning a tubular assembly within the preexisting structure; and
radially expanding and plastically deforming the tubular assembly within the preexisting structure;
wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

2. An expandable tubular member comprising a steel alloy comprising, by weight percentage, the following:
0.065 to 0.18% C,
0.006 to 1.44 % Mn,
0.006 to 0.02 % P,
0.001 to 0.004% S,
0.24 to 0.45% Si,
up to 0.16% Cu,
0.01 to 9.1% Ni, and
0.02 to 18.7% Cr.

3. An expandable tubular member, wherein the yield point of the expandable tubular member is at most about 46.9 to 61.7 ksi prior to a radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 65.9 to 74.4 ksi after the radial expansion and plastic deformation.

4. An expandable tubular member, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 5.8 to 40 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

5. An expandable tubular member, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 1.04 to at least about 1.92.

6. An expandable tubular member, wherein the expandability coefficient of the

expandable tubular member, prior to the radial expansion and plastic deformation, is greater than 0.12.

7. An expandable tubular member, wherein the expandability coefficient of the expandable tubular member is greater than the expandability coefficient of another portion of the expandable tubular member.

8. An expandable tubular member, wherein the tubular member has a higher ductility and a lower yield point prior to a radial expansion and plastic deformation than after the radial expansion and plastic deformation.

9. A method of radially expanding and plastically deforming a tubular assembly comprising a first tubular member coupled to a second tubular member, comprising:

radially expanding and plastically deforming the tubular assembly within a preexisting structure; and

using less power to radially expand each unit length of the first tubular member than to radially expand each unit length of the second tubular member.

10. A method of manufacturing a tubular member, comprising:

processing a tubular member until the tubular member is characterized by one or more intermediate characteristics;

positioning the tubular member within a preexisting structure; and

processing the tubular member within the preexisting structure until the tubular member is characterized one or more final characteristics.

11. An apparatus, comprising:

an expandable tubular assembly; and

an expansion device coupled to the expandable tubular assembly;

wherein a predetermined portion of the expandable tubular assembly has a lower yield point than another portion of the expandable tubular assembly.

12. An expandable tubular member, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 5.8 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

13. A method of determining the expandability of a selected tubular member, comprising:

determining an anisotropy value for the selected tubular member;

determining a strain hardening value for the selected tubular member; and

multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member.

14. A method of radially expanding and plastically deforming tubular members, comprising:

selecting a tubular member;

determining an anisotropy value for the selected tubular member;

determining a strain hardening value for the selected tubular member;

multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member; and

if the anisotropy value is greater than 0.12, then radially expanding and plastically deforming the selected tubular member.

15. A radially expandable tubular member apparatus comprising:

a first tubular member;

a second tubular member engaged with the first tubular member forming a joint; and

a sleeve overlapping and coupling the first and second tubular members at the joint;

wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus.

16. A method of joining radially expandable tubular members comprising:

providing a first tubular member;

engaging a second tubular member with the first tubular member to form a joint;

providing a sleeve;

mounting the sleeve for overlapping and coupling the first and second tubular members at the joint;

wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and

radially expanding and plastically deforming the tubular assembly;

wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

17. An expandable tubular member, wherein, if the carbon content of the tubular member is less than or equal to 0.12 percent, then the carbon equivalent value for the tubular member is less than 0.21; and wherein, if the carbon content of the tubular member is greater than 0.12 percent, then the carbon equivalent value for the tubular member is less than 0.36.

18. A method of selecting tubular members for radial expansion and plastic deformation, comprising:

selecting a tubular member from a collection of tubular member;

determining a carbon content of the selected tubular member;

determining a carbon equivalent value for the selected tubular member;

if the carbon content of the selected tubular member is less than or equal to 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.21, then determining that the selected tubular member is suitable for radial expansion and plastic deformation; and

if the carbon content of the selected tubular member is greater than 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.36, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

19. An expandable tubular member, comprising:

a tubular body;

wherein a yield point of an inner tubular portion of the tubular body is less than a yield point of an outer tubular portion of the tubular body.

20. A method of manufacturing an expandable tubular member, comprising:

providing a tubular member;

heat treating the tubular member; and

quenching the tubular member;

wherein following the quenching, the tubular member comprises a microstructure comprising a hard phase structure and a soft phase structure.

21. A system for radially expanding and plastically deforming a tubular member, comprising:

an expansion device positioned in the tubular member; and

wherein the coefficient of friction between the expansion device and the tubular member during radial expansion and plastic deformation is less than 0.08.

22. A method of radially expanding and plastically deforming a tubular member, comprising:

positioning an expansion device having a first tapered end and a second end at least partially within the tubular member;

displacing the expansion device relative to the tubular member to radially expand and plastically deform the tubular member; and

wherein the coefficient of friction between the expansion device and the tubular member during radial expansion and plastic deformation is less than 0.08.

23. A lubricant for injecting in an interface between a tubular member and an expansion device, comprising, by weight percentage:

64.25% to 90.89% canola oil;

0.02% to 0.05 % tolyltriazole;

0.5 % to 1.0% aminic antioxidant;

0.5% to 2.0 % phenolic antioxidant;

4% to 12% sulfurized natural oil or sulferized lard oil;

4% to 12 % phosphate ester;

0.4% to 1.5% phosphoric acid;

0.08% to 1.5 % styrene hydrocarbon polymer;

0.1% to 0.5 % alkyl ester copolymer;

0.01% to 0.2 % silicon based antifoam agent; and

1% to 5% carbozylic acid soap.

24. An expansion device for radially expanding and plastically deforming the tubular member, comprising:

one or more expansion surfaces on the expansion device for engaging the interior surface of the tubular member during the radial expansion and plastic deformation of the tubular member; and

a lubrication device operably coupled to the expansion surface for injecting lubricant into an interface between the expansion surface and the tubular member during the radial expansion and plastic deformation of the tubular member when a predetermined pressure for lubrication is reached.

25. An expansion device for radially expanding and plastically deforming a tubular member, comprising:

a tapered portion with an outer surface;

internal flow passage in the tapered portion; and

at least one circumferential groove having a first edge and a second edge with a predetermined sliding angle on the outer surface of the tapered portion fluidicly coupled to the internal flow passage for receiving lubricant during radial expansion and plastic deformation of the tubular member, wherein the sliding angle is less than or equal to 30 degrees.

26. A method for radially expanding and plastically deforming the tubular member, comprising:

positioning an expansion device having one or more expansion surfaces in the interior surface of the tubular member;

displacing the expansion device relative to the tubular member to radially expand and plastically deform the tubular member; and

operating a lubrication device to inject lubricant into an interface between the expansion surface and the tubular member when a predetermined lubricant pressure is reached.

27. A method of reducing the coefficient of friction between the expansion device and the tubular member during radial expansion to less than 0.08, comprising:

altering at least one of the elements selected from the group consisting of: expansion device geometry, expansion device composition, expansion device surface roughness, expansion device texture, expansion device coating, lubricant composition, lubricant environmental issues, lubricant frictional modifiers, tubular member roughness, and tubular member coating.

1046. A lubrication system for lubricating an interface between a first element and a second element, comprising:

a vaporizer proximate to the interface for vaporizing a lubricant to inject the lubricant in the interface.

28. A lubrication system for lubricating an interface between a first element and a second element, comprising:

a vaporizer proximate to the interface for vaporizing a lubricant to inject the lubricant in the interface.

29. A method for lubricating an interface between a first element and a second element, comprising:

vaporizing a lubricant proximate to the interface to inject the lubricant in the interface.

30. A system for radially expanding and plastically deforming a tubular member, comprising:

an expansion device positioned in the tubular member; and

wherein the coefficient of friction between the expansion device and the tubular member during radial expansion and plastic deformation is less than 0.08 and

wherein lubricant is stored in a reservoir with a magnetic coil in the expansion device and is injected through at least a portion of the expansion device between the tubular member and the expansion device when current runs through the magnetic coil.

31. A system for radially expanding and plastically deforming a tubular member, comprising:

an expansion device positioned in the tubular member; and

wherein the coefficient of friction between the expansion device and the tubular member during radial expansion and plastic deformation is less than 0.08 and

wherein lubricant is stored in a reservoir and injected through at least a portion of the expansion device between the tubular member and the expansion device when vaporized.

32. A method of radially expanding and plastically deforming a tubular member, comprising:

positioning an expansion device having a first tapered end and a second end at least partially within the tubular member;

displacing the expansion device relative to the tubular member to radially expand and plastically deform the tubular member; and

injecting a lubricant stored in a reservoir with a magnetic coil in the expansion device through at least a portion of the expansion device between the tubular member and the expansion device when current runs through the magnetic coil, and

wherein the coefficient of friction between the expansion device and the tubular member during radial expansion and plastic deformation is less than 0.08.

33. A method of radially expanding and plastically deforming a tubular member, comprising:

positioning an expansion device having a first tapered end and a second end at least

partially within the tubular member;

displacing the expansion device relative to the tubular member to radially expand and plastically deform the tubular member; and

vaporizing a lubricant stored in a reservoir in the expansion device and injecting it through at least a portion of the expansion device between the tubular member and the expansion device, and

wherein the coefficient of friction between the expansion device and the tubular member during radial expansion and plastic deformation is less than 0.08.

34. A lubricant delivery assembly for radially expanding and plastically deforming a tubular member, comprising:

an expansion device having a tapered portion with an outer surface, at least one reservoir for housing a lubricant, at least one circumferential groove on the outer surface fluidicly connected to the reservoir; and

a lubricant injection mechanism to force lubricant into the at least one circumferential groove while radially expanding and plastically deforming the tubular member when a predetermined lubricant pressure is reached.

35. A method of reducing the coefficient of friction between the expansion device and the tubular member during radial expansion to less than 0.08, comprising:

altering at least one of the elements selected from the group consisting of: expansion device geometry, expansion device composition, expansion device surface roughness, expansion device texture, expansion device coating, lubricant composition, lubricant environmental issues, lubricant frictional modifiers, tubular member roughness, and tubular member coating.

36. A system for radially expanding and plastically deforming a tubular member having a non-uniform wall thickness, comprising:

an expansion device having one or more expansion surfaces and a tapered portion having a tapered faceted polygonal outer expansion surface in the interior surface of the tubular member.

37. A method of radially expanding and plastically deforming a tubular member having a non-uniform wall thickness, comprising:

positioning an expansion device having one or more expansion surfaces and a tapered portion having a tapered faceted polygonal outer expansion surface in the interior surface of the tubular member; and

displacing the expansion device relative to the tubular member to radially expand and plastically deform the tubular member.

38. A method of increasing a collapse strength of a tubular member after a radial expansion and plastic deformation of the tubular member using an expansion device, comprising:

reducing a coefficient of friction between the tubular member and the expansion device during the radial expansion and plastic deformation of the tubular member; and

reducing a ratio of a diameter of the tubular member to a wall thickness of the tubular member.

39. A system for radially expanding and plastically deforming a tubular member, comprising:

a tubular member; and

an expansion device positioned within the tubular member;

wherein the coefficient of friction between the tubular member and the expansion device is less than 0.075; and

wherein the ratio of the diameter of the tubular member to a wall thickness of the tubular member is less than 21.6.

40. A method of radially expanding and plastically deforming a tubular member using an expansion device, comprising:

quenching and tempering the tubular member;

positioning the tubular member within a preexisting structure; and

radially expanding and plastically deforming the tubular member.

41. A radially expandable and plastically deformable tubular member, comprising:

a yield strength ranging from about 40.0 ksi to 100.0 ksi;

a ratio of the yield strength to a tensile strength of the tubular member ranging from about 0.40 to 0.86;

a longitudinal elongation of the tubular member prior to failure ranging from about 14.8% to 35.0%;

a width reduction of the tubular member prior to failure ranging from about 30% to

45.0%;

a width thickness reduction of the tubular member prior to failure ranges from about 30.0% to 45%; and

an anisotropy of the tubular member ranges from about 0.65 to 1.50.

42. A method of manufacturing a tubular member, comprising:

fabricating a tubular member having intermediate properties;

positioning the tubular member within a preexisting structure;

radially expanding and plastically deforming the tubular member within the preexisting structure; and

baking the tubular member within the preexisting structure to convert one or more of the intermediate properties to final properties.